

# PATENT SPECIFICATION

698,464

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Date of filing Complete Specification : Feb. 18, 1952.

Application Date : May 22, 1951. No. 11904/51.

(Patent of Addition to No. 664,905 dated Sept. 14, 1950).

Complete Specification Published : Oct. 14, 1953.

Index at Acceptance :—Class 35, B4.

## COMPLETE SPECIFICATION.

### Improvements in and relating to Devices for Centralizing Casing in Boreholes.

I, ALBERT EDWARD ATKINSON, of Ditton Edge, 108 Manor Road North, Hinchley Wood, Esher, in the County of Surrey, a British Subject, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to devices for centralizing casing in boreholes in conjunction with well drilling and like operations of the kind comprising an annular series of bowed springs secured at their ends to spaced rings which are adapted to be fitted to the exterior of the casing or pipe so that the bowed portions of the springs can engage the wall of the borehole.

In the Specification of my Patent No. 664,905 there is described a device of the above kind in which the bowed springs are connected to their end rings in such a manner that the bowed spring portions can be initially stressed to increase their resistance to lateral loads, the springs being fulcrumed upon the casing or pipe for this purpose. It is one of the objects of the present invention to provide an improved device of the kind described which affords greater freedom of relative rotation between the device and the casing or pipe. Another object is to provide an improved device which can be employed in conjunction with a single stop ring or equivalent means only, which affords longitudinal lost motion between the device and the casing or pipe.

The invention comprises an improvement in or modification of a device according to Patent No. 664,905, in which initial stressing of the bowed springs is effected by an engagement or fulcrum of a part or parts of the spring upon one or both of the end rings.

The invention also comprises a device according to the preceding paragraph in which one or both of the end rings is extended axially to provide a continuous peripheral portion upon which the springs are engaged. The springs may be similar to those described in the above mentioned Patent but with the outwardly cranked portions omitted.

The invention further comprises a device according to either of the two preceding paragraphs, applied to a casing or pipe having a single stop ring or equivalent stop lugs.

In the accompanying drawings:—

Figure 1 is a side elevation of a centralizing device constructed and arranged according to the invention;

Figure 2 is a side elevation, partly in section, to an enlarged scale of one of the end rings of the device;

Figure 3 is an end view of the device, showing the position of the ring when opened out.

In carrying the invention into effect according to one convenient mode, the device comprises an annular series of bowed springs 1 secured at their ends to spaced rings 2 which are fitted to the exterior of the bore hole casing 3 so that the bowed portions of the springs can engage the wall of the bore hole. Each of the springs 1 is formed as described in the Specification of Patent No. 664,905 but with the outwardly cranked portions omitted. Each spring comprises a bowed portion having at each end a portion 4 that is parallel to the casing when the device is assembled thereon and joined to an end or extension portion 5 having at its end a turned out lug 6. The spring is formed so that when in free condition and disconnected from the end rings,

the integral spring extensions 5 can be inclined outwardly with respect to a plane surface upon which the spring is laid, as described in the above mentioned patent.

5 This position is shown in chain dotted lines in Figure 1 for one end of the spring. Such formation results in the spring being stressed when the said extension portions are brought into parallel relation when the spring is

10 mounted on the rings. The end rings 2 are of greater axial length than the rings described in the above mentioned Patent Specification and have a substantially peripherally continuous portion 7 at their inner ends

15 upon which the portions 4 of the springs are engaged when the spring end is secured to the ring, thereby affording a fulcrum for the stressing of the spring. Each of the end rings is split and is formed by a pair of

20 half rings 2a and 2b connected by hinges 8. By removing one of the hinge pins the ring can be opened as shown by broken lines in Figure 3 for removal from the casing.

25 Each ring or ring half is formed with a series of axially extending rectangular openings 9 in which the spring ends can be received. Lugs or bridge portions 10 of shallow channel shape extend across the said openings towards the outer end of the ring to leave a narrow slot at said end to receive

30 the turned out lugs 6 at the spring ends. The lugs or bridge portions 10 may be formed integrally with the rings or may be welded thereto as may be desired. Stop members 11 are formed, or welded, on the

35 ring at the outer end of each of said slots to form an abutment for the spring end. The arrangement is such that when the springs are connected to the rings and assembled on the casing or pipe 3, each spring bow is

40 initially stressed by the displacement of the spring extension portions 5 by engagement of the portions 4 with the end rings to maintain such portions of the springs substantially parallel with the casing. The inner

45 edges of the bridge pieces 10 may be chamfered as shown at 12 if desired to facilitate insertion of the springs. When using such an arrangement, there is no engagement between the springs and the casing or pipe so that the latter is free to turn inside the device and is not subject to frictional drag.

50 A centralizing device as described above can be used in conjunction with the usual pair of casing stop rings such as are illustrated in the Patent Specification referred to previously but if desired a single stop ring or its equivalent may be employed. A single stop ring is shown at 13 in Figure

60 1. Instead of a stop ring, two or more lugs may be welded or otherwise secured to the casing or pipe so that they serve as the equivalent of a ring. The use of such stop lugs is permissible with a centralizing device

65 as described above by reason of the end

rings being peripherally continuous at their inner ends, i.e. there are no openings within which such stops could be accidentally engaged. When using a single stop, lost motion is afforded between the casing and the device, and when movement of the casing is reversed it will travel the distance between the end rings before engaging the device. This may be an advantage in some circumstances since the device will thereby be jarred. Also when setting or picking up casing slips for the addition of a new length of casing the small movement of the casing involved will not displace the centralizing device.

It will be appreciated that with the construction according to the invention, it is not possible readily to disengage the bowed springs from the end rings once they have been assembled thereon, since by the very nature of the pre-stressed springs, special tools are necessary to force the spring ends into the ring openings 9 and under the bridge portions 10 and to force the springs longitudinally until their turned out lugs 6 engage in the slots, the tool being then removed. When assembled the blades and end rings form a unitary whole, similar to the known riveted centralizers, irrespective of whether the centralizer is on the casing or not. Thus the dismantling of an assembled unit would be an extremely difficult operation, but is not normally required. If desired by the user, the end rings and springs can be dispatched separately for assembly on site.

It will be understood that if desired, the end rings may be of continuous or integral construction instead of split as previously described.

What I claim is:—

1. An improvement in or modification of a centralizing device according to Patent No. 664,905, in which an initial stressing of the bowed springs is effected by an engagement or fulcrum of a part or parts of the spring upon one or both of the end rings.

2. A device as claimed in Claim 1, in which one or both of the end rings has an axially extending portion upon which the springs are engaged.

3. A device as claimed in Claim 2, in which said axially extending portion is substantially continuous peripherally.

4. A device as claimed in any of the preceding claims, in which the springs are releasably engaged with the end rings.

5. A device as claimed in Claim 4, in which the spring ends have outwardly turned portions or lugs which are engaged within openings or slots in the rings.

6. A device as claimed in Claim 5, in which the end rings have axially extending openings with bridge pieces extending over the openings to form slots, and the spring

ends are inserted beneath the bridge pieces with their outwardly turned portions in the said slots.

7. A device as claimed in Claim 6, in which stop members are provided on the ring at the outer end of each slot to form an abutment for the spring end.

8. A device as claimed in any of the

preceding claims when applied to a casing or pipe having a single stop ring or equivalent stop lugs. 10

9. The improved centralizing device substantially as hereinbefore described with reference to the accompanying drawings.

MARKS & CLERK.

# PROVISIONAL SPECIFICATION.

## Improvements in and relating to Devices for Centralizing Casing in Boreholes.

15 I, ALBERT EDWARD ATKINSON, of Ditton Edge, 108 Manor Road North, Hinchley Wood, Esher, in the County of Surrey, a British Subject, do hereby declare this invention to be described in the following statement:—

20 This invention relates to devices for centralizing casing in boreholes in conjunction with well drilling and like operations, of the kind comprising an annular series of bowed springs secured at their ends to spaced rings which are adapted to be fitted to the exterior of the casing or pipe so that the bowed portions of the springs can engage the wall of the borehole.

30 In the Specification of my Application for Patent No. 32190 of 1949 (Serial No. 664,905) there is described a device of the above kind in which the bowed springs are connected to their end rings in such a manner that the bowed spring portions can be initially stressed to increase their resistance to lateral loads, the springs being fulcrumed upon the casing or pipe for this purpose. It is one of the objects of the present invention 40 to provide an improved device of the kind described which affords greater freedom of relative rotation between the device and the casing or pipe. Another object is to provide an improved device which can be employed in conjunction with a single stop ring or equivalent means only, which affords longitudinal lost motion between the device and the casing or pipe.

45 The invention comprises an improvement in or modification of a device according to Application for Patent No. 32190 of 1949 (Serial No. 664,905), in which initial stressing of the bowed springs is effected by an engagement or fulcrum of a part or parts of the spring upon one or both of the end rings.

50 The invention also comprises a device according to the preceding paragraph in which one or both of the end rings is extended axially to provide a continuous peripheral portion upon which the springs are engaged, the outwardly cranked portion of the spring being omitted.

The invention further comprises a device according to either of the two preceding paragraphs applied to a casing or pipe having a single stop ring or equivalent stop lugs. 65

In carrying the invention into effect according to one convenient mode as applied to a centralizing device of the kind described, each of the steel springs is formed as described in the Specification of Patent Application No. 32190 of 1949 (Serial No. 664,905) but with the outwardly cranked portions omitted. When the spring is free and disconnected from the end rings, the integral spring extensions can be inclined outwardly with respect to a plane surface upon which the spring is laid. The end rings are of greater axial length than the rings described in the above mentioned Specification and have a peripherally continuous portion at their inner ends upon which an intermediate portion of the spring is engaged when the spring end is secured in the ring, thereby affording a fulcrum for the stressing of the spring. Each ring may conveniently comprise a sleeve having formed in it a series of axially extending rectangular openings in which the spring ends can be received. Lugs of shallow channel shape are welded or otherwise secured across the said openings towards the outer end of the ring to leave a narrow slot at said end to receive the turned out lugs at the spring ends. If desired, a stop member may be welded to or otherwise formed on the ring at the outer end of each of said slots to form an abutment for the spring end. The arrangement is such that when the springs are connected to the rings and assembled on the casing or pipe, each spring bow is initially stressed by the displacement of the spring extensions by engagement of the outer ends of the bowed portions with the end rings to force such portions of the springs apart. It may be desirable to chamfer the corners at the inner ends of the rectangular openings where the springs pass over them. When using such an arrangement, there is no engagement be- 110

tween the springs and the casing or pipe so that the latter is free to turn inside the device and is not subject to frictional drag.

- 5 A centralizing device as described above can be used in conjunction with the usual pair of casing stop rings, but if desired a single stop ring or its equivalent may be employed. Thus the stop may comprise two or more lugs welded or otherwise
- 10 secured to the casing or pipe. The use of such stop lugs is permissible by reason of the end rings being peripherally continuous at their inner ends, i.e. there are no openings within which such stops could be
- 15 accidentally engaged. When using a single stop, lost motion is afforded between the casing and the device and when movement of the casing is reversed it will travel the

distance between the end rings before engaging the device. This may be of advantage in some circumstances since the device will thereby be jarred. Also when setting or picking up casing slips for the addition of a new length of casing the small movement of the casing involved will not displace the centralizing device. 20 25

It will be understood that the improvement is not restricted to the above example, since the details of construction of the end rings and of the mode of connecting the springs thereto may be variously modified. Also if desired, the end rings may be of split construction as described in the Patent Specification referred to previously. 30

MARKS & CLERK.

Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1953.  
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